CURRICULUM VITAE
Michael Maclean Wolf

Sandia National Labs
CSRI/155
P.O. Box 5800, MS 1320
Albuquerque, NM 87185-1320

mmwolf@sandia.gov
(505) 284-9963 (office)
(217) 390-3635 (home)
http://www.sandia.gov/˜mmwolf/

Research Interests

- High-performance computing, scientific computing, combinatorial algorithms.

Education

- Ph.D., Computer Science, University of Illinois at Urbana-Champaign, 2009.
  Advisor: Professor Michael T. Heath.
- B.S., Computer Science and Biology, Harvey Mudd College, 1998.

Professional Experience

- **Postdoc** (2009-present), Scalable Algorithms Dept., Sandia National Laboratories, Albuquerque, NM, Staff Mentor: Karen Devine. Research into scalable multicore/manycore algorithms, performance of climate modeling software, sparse matrix partitioning and ordering.

- **Graduate Research Assistant** (2007-2009), University of Illinois at Urbana-Champaign Computer Science Department, under the direction of Michael T. Heath.

- **Graduate Professional Intern** (Summers 2007, 2008), Computer Science Research Institute, Sandia National Laboratories, Albuquerque, NM, Staff Mentor: Erik Boman. Researched and developed two-dimensional matrix partitioning algorithms for reducing communication volume in parallel sparse matrix-vector multiplication as part of CSCAPES, a DOE SciDAC Institute.

- **DOE CSGF Intern** (Summer 2006), Computer Science Research Institute, Sandia National Laboratories, Albuquerque, NM. Researched agent-based disease propagation models to be used in inverse problem of disease characterization from patient data. Researched combinatorial optimization problem of reducing the number of operations in matrix-vector multiplication.

- **DOE CSGF Intern** (Summer 2004), NERSC Scientific Computing Group, Lawrence Berkeley National Laboratory, Berkeley, CA. Researched and improved performance of parallel matrix-vector multiplication with scalar addition algorithm. Researched computational biology problems of protein folding.

- **Software Developer** (1998-2003), Advanced Computations Dept., Stanford Linear Accelerator Center, Stanford, CA. Developed parallel electromagnetic solvers and particle tracking software used in accelerator design as part of DOE SciDAC and Grand Challenge projects. Involved in setting up Linux cluster. Improved parallel performance of applications with better partitioning and communication techniques. Managed software projects and mentored seven summer students.

Journal Articles

- E.G. Boman and M.M. Wolf, "A Nested Dissection Approach to Sparse Matrix Partitioning for Parallel Computations." (submitted paper.)
- M.M. Wolf and M.T. Heath, "Combinatorial Optimization of Matrix-Vector Multiplication in Finite Element Assembly," *SIAM Journal on Scientific Computing*, Volume 31, Issue 4, 2009, pp. 2960-2980.
- A. Skjellum, D. Wooley, Z. Lu, M. Wolf, P. Bangalore, A. Lumsdaine, J. Squyres, B. McCandless, "Object-Oriented Analysis and Design of the Message Passing Interface," *Concurrency and Computation: Practice and Experience*, Volume 13, Issue 4, 2001, pp. 245-292.

Selected Conference Proceedings
- M.M. Wolf, E.G. Boman, and C. Chevalier, "Improved Parallel Data Partitioning by Nested Dissection with Applications to Information Retrieval." (in preparation)
- E.G. Boman, U.V. Catalyurek, C. Chevalier, K.D. Devine, I. Safro, and M.M. Wolf. "Advances in Parallel Partitioning, Load Balancing, and Matrix Ordering," *J. of Physics: Conference Series*, vol. 180, 012008. (SciDAC09 Conference, San Diego, June 2009.)
- M.M. Wolf, E.G. Boman and B. Hendrickson, "Optimizing Parallel Sparse Matrix-Vector Multiplication by Corner Partitioning," PARA08, Trondheim, Norway, May 2008. (accepted paper)
- M. Wolf, A. Guetz and C.-K. Ng, "Modeling Large Accelerator Structures with the Parallel Field Solver Tau3P," *18th Annual Review of Progress in Applied Computational Electromagnetics: ACES 2002*.
- N. Folwell, L. Ge, V. Ivanov, Z. Li, C.-K. Ng, G. Schussman, M. Weiner, M. Wolf, and K. Ko, "Numerical Studies of Field Gradients and Dark Currents in SLAC Structures," *Proceedings of the International Computational Accelerator Physics Conference*, 2002.
- L.-Q. Lee, L. Ge, M. Kowalski, Z. Li, C.-K. Ng, G. Schussman, M. Wolf, K. Ko, "Solving Large Sparse Linear Systems in End-to-end Accelerator Structure Simulations," *Proceedings of 18th International Parallel and Distributed Processing Symposium*, 2004.

Selected Presentations
- "Improved Data Partitioning by Nested Dissection with Applications to Information Retrieval," SIAM Workshop on Combinatorial Scientific Computing, Seaside, CA, Oct. 29-31, 2009. (Refereed presentation).
- "Hypergraph-Based Combinatorial Optimization of Matrix-Vector Multiplication," 2008 SIAM Annual Meeting, San Diego, CA, July 7-11, 2008. (Minisymposium Talk and **Co-Organizer** MS110.)
- "Optimizing Parallel Sparse Matrix-Vector Multiplication by Partitioning," 2008 CSCAPES Workshop, Santa Fe, NM, June 10-13, 2008. (Invited Talk.)
- "Nested Dissection Approach for Sparse Matrix Partitioning," SIAM Conference on Parallel Processing for Scientific Computing, Atlanta, GA, 2008. (Contributed Talk.)
- "Using Parallel Mesh Partitioning Strategies to Improve the Performance of Tau3P, an Electromagnetic Solver," SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, CA, 2004. (Contributed Talk.)
- "Combinatorial Optimization of Matrix-Vector Multiplication," SciDAC 2007 Conference, Boston, MA. (Poster Presentation.)

Technical Reports and Other Papers
- M. Wolf and E. Boman, "An Increasing Role for Combinatorial Methods in Large-Scale Parallel Simulations," *SIAM News*, Volume 41, Number 5, June 2008.
- J. Ray, B. M. Adams, K. D. Devine, Y. M. Marzouk, M. M. Wolf, and H. N. Najm, "Distributed Micro-Releases of Bioterror Pathogens: Threat Characterizations and Epidemiology from Uncertain Patient Observables," SANDIA Technical Report SAND2008-6044, Sandia National Laboratories, 2008.

Honors, Awards, and Travel Grants
- **Department of Energy Computational Science Graduate Fellowship (CSGF)**, 2003-2007.
- **University of Illinois Fellowship**, 2007-2008.
- SIAM Student Chapter Certificate of Recognition as UIUC Student Chapter President, 2008.
- SIAM Travel Award, Conference on Parallel Processing for Scientific Computing, 2008.
- Co-author of Best Poster, International Computational Accelerator Physics Conference, 1998.

Service
- **Organizer**, Gene Golub Symposium at UIUC, Urbana, Illinois, February 29 - March 1, 2008.
- SIAM UIUC Student Chapter: **President** (2007-2009), Vice-President (2006-2007).
- Reviewer: *Applied Mathematics and Computation*, *Intl. Journal of High Performance Computing*.

Computer Skills
- Languages: C++, C, Matlab, Perl, Java, FORTRAN 77, Python, Lex, Yacc, et al.
- Systems: UNIX (MacOS X, Linux, Solaris, etc.), MS-Windows.
- Libraries: MPI, OpenMP, Zoltan, ParMETIS, Trilinos, PETSc, BLAS, SuperLU, et al.